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| 10/800,033 | 03/15/2004 | Peter C. Eklund | 025756-00003 | 6871 |
| 4372 | 7590 | 04/13/2007 | EXAMINER | |
| ARENT FOX PLLC 1050 CONNECTICUT AVENUE, N.W. SUITE 400 WASHINGTON, DC 20036 | | | SAVAGE, JASON L | |
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| SHORTENED STATUTORY PERIOD OF RESPONSE | | MAIL DATE | DELIVERY MODE | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/800,033

Applicant(s)

EKLUND ET AL.

Examiner

Jason L. Savage

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14, 22 and 23 is/are pending in the application.
- 4a) Of the above claim(s) 14, 15, 22 and 23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 11-14 is/are rejected.
- 7) ☐ Claim(s) 8-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Objections

Claims 8-10 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Amended claim 1 now recites all of the limitations which are included in claims 8-10 which render them as failing to further limit the parent claim.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 6 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 recites said metal nanoparticles are selected from the claimed materials; however claim 6 depends on claim 1 which recites the metal nanoparticles are either particles with an Mg core or platelets which comprise Pd particles. As such, it is unclear what metal nanoparticles Applicant is referencing in claim 6 since it would appear that the nanoparticle materials have already been defined in claim 1. Does Applicant intend for the metal nanoparticles of claim 6 to be the equiaxial particles or possibly a second set of platelets having a different composition than the Pd platelets?

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For Examination purposes, the claim has been treated as meaning that the metal nanoparticles are Mg or Pd such as recited in claim 1.

Claim 12 recites said metal is selected from the claimed materials; however claim 12 depends on claim 2 which ultimately depends from claim 1. Claim 2 recites the metal nanoparticles are a mixture of platelets and equiaxial particles and claim 1 recites that the platelets comprise Pd particles. As such, it is unclear what metal Applicant is referencing in claim 12 since it would appear that the platelets are required to contain Pd from the limitation in claim 1. Does Applicant intend for 'the metal' to be the metal used for the equiaxial particles, a second set of platelets having a different composition than the Pd platelets? For Examination purposes, the claim has been treated as meaning that the metal Pd such as recited in claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, 11 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masel et al. (US 2003/0198852) in view of Snow et al. (US 6,589,312).

Masel teaches a hydrogen storage material comprising metal nanoparticles that have a metal core covered by a metal shell or metal coating which may be formed Pt,

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Pd, Ru, Re, Ir, Au, Ag, Co, Fe, Ni, Y, and Mn (par[0050-0051]). Masel further teaches that the coating may comprise an oxidation resistant material or material which provides catalysis for dehydrogenation such as palladium and ruthenium which is formed on a platinum core (par [0051]).

Masel teaches what is set forth above but is silent to the claim limitations. Regarding the limitation that the nanoparticles are b) a metal core of Mg or alloy containing Mg which is covered by a metal shell; Snow teaches hydrogen storage materials comprising metal nanoparticles (col. 9, ln. 2-19). Snow also teaches that the nanoparticles may be coated to provide enhanced properties such as improved surface activity and oxidation resistance (col. 10, ln. 5-11 and col. 16, ln. 48-55). Snow further teaches that due to the enhanced activity of the nanoparticles, other materials which are cheaper and lighter than conventional materials may be used for the cores including metals of magnesium (col. 10, ln. 18-29). It would have been obvious to one of ordinary skill in the art at the time of the invention to have used magnesium for the core of Masel in order to have formed a cheaper and lighter hydrogen storage material.

Regarding the limitation that the nanoparticles are a) a mixture of nanometer scale platelets and nanometer equiaxial particles, the references do not exemplify embodiments which meet the claim limitations. However, Snow teaches that the nanoparticles can be provided in various shapes, structure, material alloying and other intrinsic properties can be controlled and can be combined with the selection of materials, mixtures and alloys to drastically increase the permutations and combinations of possible hydrogen storage systems (col. 11, ln. 6-14). It would have been within the

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purview of one of ordinary skill in the art to have provided mixtures of nanoscale materials including mixtures of particles having varying shapes such as the mixture of platelets and equiaxial particles as claimed with a reasonable expectation of success. Absent a teaching of the criticality or showing of unexpected results from the combination of the claimed shapes of nanoparticles, it would not provide a patentable distinction over the prior art. Regarding the limitation that the platelets are Pd particles, it would have been obvious to one of ordinary skill in the art to have selected any of the disclosed materials for uses as the nanoparticles including the use of palladium as claimed. Regarding the claim limitations drawn to the dimensions of the platelets, the references do not exemplify embodiments within the claimed ranges. However, since the references teach the use of nanoscale particles, one would expect for the dimensions of the particles and platelets to be of the same order of magnitude as that claimed by Applicant. It would have been within the purview of one of ordinary skill in the art to have determined what suitable dimensions for the particle could be used with a reasonable expectation of success. Absent a teaching of the criticality or showing of unexpected results from the claimed thickness, face dimension and aspect ratio is merely a design choice and does not patentably distinguish the present invention over the prior art of record. *Eskimo Pie Corp. v. Levous et al.*, 3 U.S.P.Q. 23. *In re Rose* 105 U.S.P.Q. 237. *In re Dailey* 149 U.S.P.Q. 47.

Regarding claim 3, the references teach that Mg may be used as a core materials but are silent to the coating being a metal more noble than the core. However, Masel teaches that the materials suitable for use as the coating layer on the

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core include noble metals. It would have been obvious to one of ordinary skill in the art at the time of the invention to have coated the Mg core with a coating material that is more noble since the references teach that the materials are suitable for use in the coated nanoparticles.

Regarding claim 5, Masel teaches that the coatings may be provided as multiple coatings such as a first coating of Pd and a second coating of Ru (par[0088]). The recited coatings would meet the limitation of being both oxidation resistant and providing catalysis for dehydrogenation.

Regarding claim 7, Masel teaches the metal nanoparticle material and coating materials may be many of the same elements claimed by Applicant.

Regarding claims 11 and 13, as was set forth above in the rejections to claims 3 and 5, it would have been obvious to have formed a first coating which is more noble than the Mg core as well as an optional second coating that provides catalysis for dehydrogenation wherein the coating materials are materials such as those claimed.

Claims 1-7, 11 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Snow et al. (US 6,589,312) in view of Masel et al. (US 2003/0198852).

Snow teaches hydrogen storage materials comprising metal nanoparticles (col. 9, ln. 2-19). Snow further teaches that due to the enhanced activity of the nanoparticles

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other cheaper or lighter materials may be used including metals of magnesium (col. 10, ln. 18-29). Snow also teaches that the nanoparticles may be coated to provide enhanced properties such as improved surface activity and oxidation resistance (col. 10, ln. 5-11 and col. 16, ln. 48-55).

Regarding the limitation that the nanoparticles are b) a metal core of Mg or alloy containing Mg which is covered by a metal shell; while Snow teaches a core material of Mg, it is silent to the nanoparticle having a coating forming a shell structure on the Mg core. Masel teaches a hydrogen storage material comprising metal nanoparticles that have a metal core covered by a metal shell or metal coating which improves the nanoparticles activity as a catalyst (par[0050-0051]). It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the coated nanoparticles of Snow by applying a metal coating as taught by Masel in order to have provided the nanoparticle of Snow with increased activity.

Regarding the limitation that the nanoparticles are a) a mixture of nanometer scale platelets and nanometer equiaxial particles, the references do not exemplify embodiments which meet the claim limitations. However, Snow teaches that the nanoparticles can be provided in various shapes, structure, material alloying and other intrinsic properties can be controlled and can be combined with the selection of materials, mixtures and alloys to drastically increase the permutations and combinations of possible hydrogen storage systems (col. 11, ln. 6-14). It would have been within the purview of one of ordinary skill in the art to have provided mixtures of nanoscale materials including mixtures of particles having varying shapes such as the mixture of

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platelets and equiaxial particles as claimed with a reasonable expectation of success. Absent a teaching of the criticality or showing of unexpected results from the combination of the claimed shapes of nanoparticles, it would not provide a patentable distinction over the prior art. Regarding the limitation that the platelets are Pd particles, Masel teaches the nanoparticles may be formed of Pt, Pd, Ru, Re, Ir, Au, Ag, Co, Fe, Ni, Y, and Mn (par[0050-0051]). It would have been obvious to one of ordinary skill in the art to have selected any of the disclosed materials for uses as the nanoparticles including the use of palladium as claimed. Regarding the claim limitations drawn to the dimensions of the platelets, the references do not exemplify embodiments within the claimed ranges. However, since the references teach the use of nanoscale particles, one would expect for the dimensions of the particles and platelets to be of the same order of magnitude as that claimed by Applicant. It would have been within the purview of one of ordinary skill in the art to have determined what suitable dimensions for the particle could be used with a reasonable expectation of success. Absent a teaching of the criticality or showing of unexpected results from the claimed thickness, face dimension and aspect ratio is merely a design choice and does not patentably distinguish the present invention over the prior art of record. *Eskimo Pie Corp. v. Levous et al.*, 3 U.S.P.Q. 23. *In re Rose* 105 U.S.P.Q. 237. *In re Dailey* 149 U.S.P.Q. 47.

Regarding claims 3-4 and 7, it would have been obvious to have applied the noble metal coating materials taught by Masel as the coating material on the magnesium core nanoparticle of Snow with a reasonable expectation of success. The

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noble metal coatings would meet the limitation of being oxidation resistant and providing catalysis for dehydrogenation.

Regarding claims 5, 11 and 13, Masel teaches that the coatings may be provided as multiple coatings such as a first coating of Pd and a second coating of Ru (par[0088]). It would have been within the purview of one of ordinary skill in the art to have recognized that multiple coatings could be provided on the nanoparticle core of Snow with a reasonable expectation of success.

Response to Arguments

Applicant's arguments filed 1-18-07 have been fully considered but they are not persuasive.

Applicant made amendments to independent claim 1 taking limitations from claims 20 and 21 which had been indicated to contain allowable subject matter in the previous action, paper 20061013. However, the prior claims recited that the hydrogen storage material contain coated Mg nanoparticles (as recited in claim 22 **and** (emphasis added) platelets comprising nanometer scale Pd platelets having the claimed dimensions (recited in claim 21, which ultimately depends from claim 22). Upon review of the claim and limitations, it is unclear if Applicant intended to claim that both the core/shell coated Mg particles and Pd platelet particles having the claimed dimensions were both intended to be contained in the hydrogen storage material or if there was some inadvertent error due to some mix-up with the dependency of the claims.

However, while amended claim 1 contains similar limitations from claims 21 and 22, it

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recites that the nanoparticles may be a) a mixture of PD platelets and/or (emphasis added) b) a Mg core covered by a metal shell or coating. As such, the prior art reads on the claims for the reasoning set forth in the rejections above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

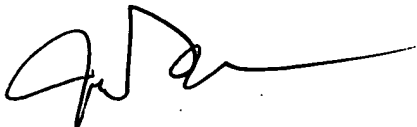
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Savage whose telephone number is 571-272-1542. The examiner can normally be reached on M-F 6:30-4:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on 571-272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Jason Savage
4-4-07



JENNIFER MCNEIL
SUPERVISORY PATENT EXAMINER

4/10/17